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Do age and conditions at rehoming affect behaviour in puppies?

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Abstract

Many dogs are abandoned, surrendered to rescue shelters or euthanised in the United Kingdom every year, with one of the most common reasons being undesirable behaviour. The age at which puppies are rehomed is widely thought to affect their behaviour. It has also been suggested that the conditions from which puppies are rehomed may increase the prevalence of some behaviours, such as fear. This study aimed to see if there are any management factors which can reduce the prevalence of undesirable behaviours in puppies. 65 puppy owners that attend puppy classes participated in this study. Owners of puppies from the age of ten weeks to six months were given a questionnaire, requiring information on the behaviour of the puppy and its source. The age at rehoming did not significantly affect the amount of fear behaviours shown by puppies, however, puppies rehomed from outbuildings showed significantly more fear behaviours, on more occasions, than puppies that were rehomed from homes ($P < 0.001$). Puppies rehomed from outbuildings were reported to bond with other family members less well than puppies rehomed from homes ($P < 0.05$). Puppies trained using only positive reinforcement were more likely to be successful at given behavioural attributes (bite inhibition, house training, and obedience) than puppies trained using a combination of positive and negative reinforcement ($P < 0.02$). The study highlighted several management factors which appear to be related to lower frequency of fear behaviours in puppies, increased likelihood of learnt behavioural attributes, and increased bond with family members other than the owner. These findings may help to reduce the number of dogs which are euthanised or rehomed annually, and thus may help to improve canine welfare.

Keywords: Fear, Puppies, Welfare, Training methods, Reinforcement, Socialisation

Introduction

Undesirable behaviours are common in the domestic dog (*Canis Familiaris*) population. It has been estimated that up to 90% of dogs may exhibit behaviours that their owners find unacceptable (Vacalopoulos and Anderson, 1993). It is widely considered that the exhibition of problematic behaviours may be indicative of compromised welfare (Fatjo et al., 2006; Hiby et al., 2004; Blackwell et al., 2008). This is because the existence of behavioural problems can lead to rehoming (Scarlett et al., 2002) or euthanasia (Gazzano et al., 2008; Fatjo et al., 2006; Overall, 1997). Behavioural problems are known to weaken the pet-owner relationship (Mugford, 1981). Satisfied owners are less likely to rehome, abandon or euthanise their dogs (Arkow and Dow, 1984). Wells (1996) found that over 30% of dogs relinquished by their owners to rescue shelters are abandoned because of behaviour problems, and Overall (1997) found that 50-70% of animals taken to shelters were euthanised because of their behaviour. Fear in dogs dramatically increases the incidence of undesirable behaviours such as avoidance, defensive aggression, phobias and separation anxiety (Overall, 1997; Dreschel, 2010). Therefore the minimisation of the development of fear behaviours is likely to have substantial benefits to the welfare of dogs.

The early experiences of dogs are widely thought to affect their behaviour. It is assumed dogs go through sensitive periods, at which the experiences of the dog can have a lifelong impact (Scott and Fuller, 1965; Serpell and Jagoe, 1995; Overall, 1997). The first socialisation period is thought to be from two-and-a-half to three weeks to around 12 to 14 weeks (Appleby et al., 2002; Freedman et al., 1961). This period is viewed as being the most important for puppies' development because they appear to become emotionally sensitive to their surroundings (Jones, 2007). Scott and Fuller (1965) found that if puppies are denied socialisation with humans at this time, they avoid human contact and become largely untrainable. Due to the effect of early experiences on dogs, it is likely that the rearing environment and age at rehoming may influence the behaviour of puppies.

Appleby et al. (2002) found that a non-domestic maternal environment was associated with increased aggression during veterinary examinations in adult dogs. However, Gazzano et al. (2008) found that puppies reared in kennels tended to be more emotionally stable when isolated than puppies reared in domestic environments. It was suggested the kennelled puppies would be better accustomed to being isolated when rehomed, reducing the potential for separation-related anxieties. Therefore there is some disparity within current scientific literature regarding the effects of rearing conditions in puppies.

There is also some debate as to which is the best time to acquire a puppy. Scott and Fuller (1965) proposed that the optimal time is from six to eight weeks to ensure that puppies become accustomed to both dogs and people. However, Slabbert and Rasa (1993) found that puppies separated from their mothers at seven to nine weeks of age show poorer health than puppies that remain with their mothers until she weans them (from 56 to 70 days). It appears there is no widely agreed age at which puppies should be rehomed which has optimal effects on both the mental and physical wellbeing of puppies.

Fear behaviours tested for whilst young tend to remain in adult dogs (Svartberg, 2005; Seskel et al 1999). The fear response of puppies has been successfully used as a reliable indicator of adult behaviour in guide dog puppies (Scott and Bielfelt, 1976), whilst other behaviours tend to be less reliable (Seskel et al, 1999). Fear-related problems include separation anxiety, noise phobias and fear-related aggression (Overall, 1997). Such

behaviours have been shown to have negative effects on health and lifespan (Dreschel, 2010; Mendl et al., 2010). Stimulus which provokes fear in animals can lead to defensively aggressive behaviours which can endanger those around them (Mills, 2002). Due to previous findings, this research assumes that fear behaviours shown by puppies are likely to remain in adulthood. This may represent a welfare concern due to the possible negative effects on health, life span and increased probability of some undesirable and potentially dangerous behaviours. This research aims to discover if management factors such as age and conditions at rehoming effect the behaviour of puppies. The behavioural aspects which will be focused on are fear and behavioural attributes, as these are likely to affect owner satisfaction and potentially affect the dogs' welfare.

Material and Methods

Participants

Ten puppy training groups in the county of Cornwall, England, were contacted by phone and asked if they would be willing to cooperate with the distribution of questionnaires. The aims of the study were explained. Four of the groups were unable to help with the distribution of questionnaires as the dates of classes were outside that of the research dates, and one did not wish to participate. Five of the contacted classes were willing to participate in the study. Each class was attended from the 5th January 2011 to the 1st February 2011, and the aims and objectives of the study were explained to puppy owners attending classes. Puppy owners were made aware that they did not have to participate in the study and that they could withdraw at any time. Each participant was also given an information sheet detailing the aims and objectives of the study (see appendix A). There was a 98% participation rate from puppy owners.

Puppy classes offered an easily accessible and high concentration of suitable participants (puppy owners). It also allowed for the easy collection of data on a larger than usual scale, for example, asking puppy owners in parks to complete a questionnaire; a task which would prove difficult in a largely rural and well dispersed county such as Cornwall. A wide variety of puppy owners attended puppy classes. Puppy classes were also chosen because they can act as a control against lack of socialisation, which can increase fear behaviours in dogs (Appleby et al, 2004). Therefore the results from puppies from each environment were likely to be more standardised.

Puppies in the study were required to be six months or under at the time the questionnaires were completed. This was to ensure that owners' recollection of information was as accurate as possible. It also acted as a measure to prevent as much as possible that the experiences of puppies were less influenced by outside factors. Puppies were also required to have been in the care of their present owner for at least a week, to allow for a fair assessment of their puppies behaviour.

Controls were used to eliminate variables which might interfere with the clear and precise measurement of the key factors (Denscombe, 1998). Most of the puppies in the target population were expected to have been checked by a veterinarian (as all the classes required puppies to have received their first vaccination), however, as a control, a question was included to confirm that the puppy had been checked by a veterinarian. A question was also included to confirm that puppies did not have any known health problems. One puppy that had confirmed health problems was removed from the study, as health problems can often affect a dog's behaviour (Appleby, 2004). In addition to this, one puppy

had already been rehomed more than once (from the breeder) and was removed from the study. This is because the current owner may not have been aware of incidences which may have altered the behaviour of their puppy.

Design

Questionnaires were developed with the aim of capturing the most useful information (see appendix B). The questionnaire contained 15 questions. All of the compulsory questions (13) were closed questions. Two open question were included, however, they were only necessary for puppies exhibiting health problems (as verified by a veterinarian), or puppies showing fear as a result of a particular experience (as recalled by the owner). A pilot study was conducted using 10 dog owning participants and the layout and wording of some questions was altered accordingly to improve clarity.

The use of owner assessment in the form of questionnaires given to pet owners in the evaluation of companion dog behaviour is thought to be a useful method of data collection (Svartberg, 2005). It has been used to evaluate the success of training methods (Herron et al., 2009; Hiby et al., 2004), study dog-owner relationships (Topal et al., 1997), compare personality traits in dogs (Svartberg, 2005; Svartberg et al., 2005) and to research the effects of stress in dogs (Dreschel, 2010). Therefore, the use of a questionnaire given to puppy owners is likely to give reliable and valid results, as has been suggested in several other studies.

Participants were asked the current age of the puppy (see question one, Appendix B) and the age at which the puppy was acquired (see question 4, Appendix B). There was a question requiring the owners to give information on the conditions from which the puppy was acquired with two choices; 'living in house with breeder', or 'living in a separate outbuilding' (see question seven, Appendix B). Two, short, open questions were included requiring owners to state how many puppies were in the litter from which their puppy was obtained (see question six, Appendix B), and also how many other dogs (if any) live in the current owners home (see question five, Appendix B).

Two tick-box questions were included. One listed different instances when the puppy exhibits fear and also the frequency (see question 11, appendix B). The choices for frequency were 'rarely' or 'often'. Seven occasions were listed; loud noises, strangers, dogs, new situations, children, men and women. The other listed the behavioural attributes (see question 15, appendix B); house training, bite inhibition and obedience, and required the owner to rate the success of the puppy as mostly successful or mostly unsuccessful. The questionnaires also included questions on training methods (see question eight, appendix B) with three possible answers: positive reinforcement, negative reinforcement or both.

Participants were asked how well they felt they, and other members of the family (if necessary) had bonded with the puppy, selecting one of four possible answers; 'strongly', 'well', 'slightly' or 'has not bonded' (see question 13 and 14, appendix B).

Analysis

If an owner reported a puppy as showing fear 'often' the value was interpreted as one. If an owner reported a puppy as showing fear 'rarely' the value was interpreted as zero. The number of fear behaviours per puppy was thus calculated with a maximum possible value of seven (the puppy was reported to show fear on all given occasions) and a minimum

value of zero (the puppy was reported to show fear rarely on all given occasions). Using this data, T-test analysis was used to compare individual fear behaviours in dogs with the environment from which they were rehomed. T-test analysis was also used to see if gender affected fear behaviours, and also if the presence of one or more dogs in the household affected fear behaviours shown by the puppies.

Confidence limits were calculated for puppies when classified into breed groups using the mean number of fear behaviours of each group and the standard deviation. Chi-squared analysis was used to test the relationship between the number of fear behaviours shown by puppies and the age at rehoming. Chi-squared analysis was also used to test the relationship between the conditions from which puppies were rehomed with the number of fear behaviours shown.

Chi-squared analysis was used to test the relationship between the number of behavioural attributes reported as mostly successful by the owner and the method of training the owner reported as using. The questionnaire required the owner to select 'mostly successful' or 'mostly unsuccessful' for each attribute. If an owner selected 'mostly successful', a value of one was interpreted. If an owner selected 'mostly unsuccessful', a value of zero was interpreted. Thus if a puppy was reported to be mostly successful at all three behavioural attributes, a value of three was given. A puppy scoring 'mostly unsuccessful' for each behavioural attribute was assigned a value of zero. The data for each puppy was then analysed using a chi-squared test.

Fisher's exact test was used to analyse whether the owner's opinion of their bond with the puppy, and the owner's opinion of other family members' bond with the puppy was affected by the living conditions of the puppy prior to rehoming. The bond groups 'well' and 'slight' were merged due to the fact that this bond was only recorded once, and that the two groups could be interpreted to have a similar meaning.

Ethics

Ethical clearance was granted for the distribution to human participants by the University of Plymouth's Ethics Committee. Puppy classes were only attended on the receipt of a signed consent form from each organisation. Each participant was required to sign the questionnaire they were given to confirm that they had read the information sheet (see appendix A) and had been made aware of their right to withdraw at any time. The questionnaires still remained anonymous however, as no other personal information was gathered.

Results

The population in the study was 65. This included 25 breeds from every group according to the Kennel Club (2006); gundog, hound, terrier, working, pastoral, toy and utility. The ages of puppies in the study ranged from 10 to 26 weeks. The mean age at rehoming of puppies from homes was 8.51 weeks (± 0.5). The mean age at rehoming of puppies from outbuildings was 9.45 weeks (± 1.43). 31 puppies were bitches (female) and thirty-four puppies in the study were dogs (male).

Breed

The number of puppies in each breed category according to the Kennel Club (2006) is shown in Table 1. Most of the puppies in the study were gundogs (26.2%) whilst hounds represented just 1.5%. Dogs from the pastoral group had the greatest mean number of

fear behaviours ($M = 2.1$, $SD = 2.28$). Dogs from the working group showed the fewest number of fear behaviours ($M = 0.33$, $SD = 0.52$). The confidence intervals shown in Table 1. are clearly presented in graphical form in Figure 1. This shows that dogs from the utility group had a lower confidence interval ($M = 1.8$, ± 0.73) which was higher than the upper confidence limit for dogs from the working group ($M = 0.33$, ± 0.41). This suggests a significant variation within the two breeds, suggesting that dogs from the pastoral group are likely to show a greater number of fear behaviours than dogs from the working group. The working dog group upper limit is also lower than the lower limit for the confidence intervals of all the puppies in the study combined ($M = 1.14$, ± 0.38). This suggests that dogs from the working group tend to show fewer behaviours than the dog population as a whole.

Table 1: Results from 65 puppy owners showing the breed groups included in the study. Individual breeds as recorded by owners were categorised into breed groups according to the Kennel Club. The mean and confidence interval has been calculated for each group

Group	Number in sample	% of Sample	Mean fear	Standard Deviation	Confidence interval \pm
Cross	12	18.5	0.67	0.98	0.55
Gundog	17	26.2	1.35	1.8	0.86
Hound	1	1.5	1	-	-
Working	6	9.2	0.33	0.52	0.41
Pastoral	10	15.4	2.1	2.28	1.41
Terrier	11	16.9	0.73	1.27	0.75
Toy	3	4.6	0.66	1.15	1.31
Utility	5	7.7	1.8	0.84	0.73
All dogs	65	100	1.14	1.55	0.38

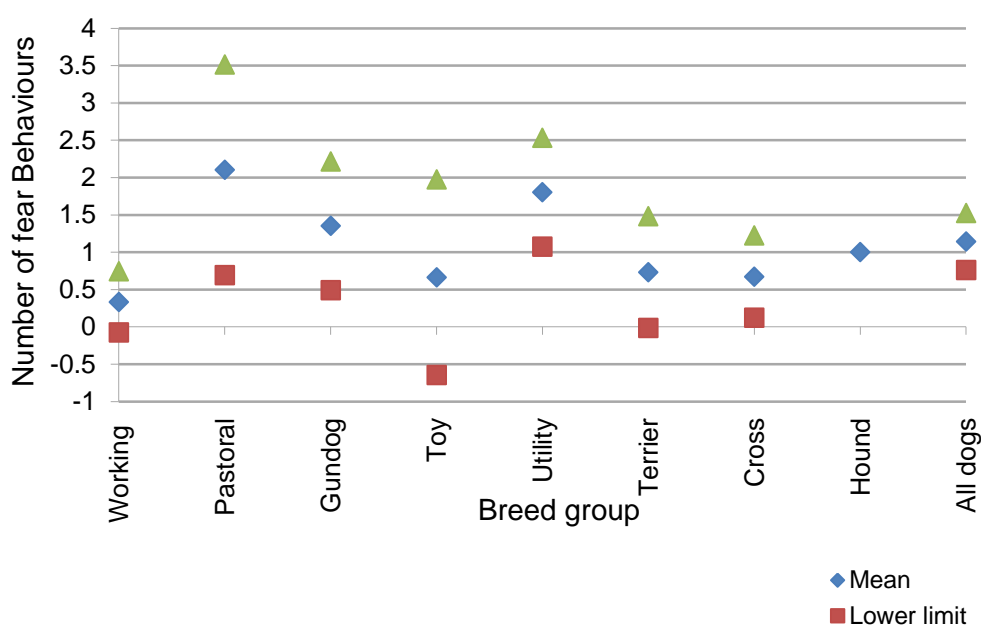


Fig.1. Confidence intervals of fear behaviours shown by 65 puppies when classified into breed groups

Age at rehoming

The age at rehoming did not significantly affect the amount of fear behaviours shown by puppies ($p>0.05$). This suggests that the age at rehoming is not an important factor causing fear in dogs.

Living conditions

Table 2. shows the mean average number of fear behaviours shown by dogs reared in homes was 1.6 compared to 2.3 for puppies rehomed from outbuildings. Puppies reared in outbuildings showed significantly more fear behaviours than those reared in homes ($X^2=12.33$, $P <0.001$). The majority of puppies (60%) reared in a home environment showed fear under none of the conditions listed in the questionnaire, whilst the majority of puppies reared in an outbuilding showed two or more fear behaviours (65%). This suggests that the conditions from which puppies are rehomed has a great effect on the frequency and occasion at which puppies show fear.

Table 2: The number and percentage of fear behaviours shown by 65 puppies rehomed from homes or outbuildings. Also shown is the mean number of fear behaviours for each group and the significance, calculated using chi squared

Living conditions	Number of fear behaviours shown by puppies N (%)					Chi Squared
	0	1	2	3+	Mean	
Outbuilding	4 (20)	3 (15)	6 (30)	7 (35)	2.3	$X^2=12.33$
Home	27 (60)	10 (22.22)	6 (13.33)	2 (4.44)	1.6	$p<0.001$

Table 3. shows that the only puppies reported to show a fear of men or women were those reared in outbuildings. Fear of loud noises did not differ from puppies raised in outbuildings or homes ($P>0.05$). Puppies reared in outbuildings showed significantly more fear of strangers than puppies reared in homes ($t=3.55$, $P<0.001$). Fear of dogs was significantly higher in dogs reared in outbuildings ($t=2.94$, $P<0.01$). More puppies reared in outbuildings showed fear of new situations than puppies reared in homes ($t=3.88$, $P<0.001$). Puppies reared in outbuildings were more likely to show fear of children than puppies reared in barns ($t= 2.57$, $P<0.05$). Fear of men was only reported in puppies reared in outbuildings ($t=2.77$, $P<0.01$), as did fear of women ($t=2.2014$, $P<0.05$). Puppies reared in homes were significantly more likely to show fear under no circumstances than puppies raised in outbuildings ($t=3.16$, $P<0.01$). Therefore it appears that puppies reared in outbuildings appear to be significantly more likely to show fear behaviours in response to more stimuli than puppies reared in homes.

Training method

The training method employed by owners did seem to influence the success of puppies at three given behavioural attributes (house training, bite inhibition and obedience). Table 4. shows that puppies trained using positive reinforcement techniques were significantly more likely ($X^2 =5.48$, $P=>0.05$) to be classed as mostly successful for the three attributes. The training method appeared not to affect the amount of fear behaviours shown by puppies ($X^2 =1.57$, $P=>0.05$).

Table 3: Reports of 65 owners of puppies from ten weeks to six months comparing the frequency of fear behaviours of puppies reared in homes and outbuildings

Fear	Living conditions		Results t-test
	Home %	Outbuilding %	
Loud noises	22	40	t = 1.481 p = 0.144
Strangers	4.4	35	t = 3.55 p = 0.0007
Dogs	13.2	45	t = 2.936 p = 0.005
New situations	19.8	65	t = 3.8773 p = 0.0003
Children	2.2	20	t = 2.569 p = 0.013
Men	0	15	t = 2.774 p = 0.0073
Women	0	10	t = 2.201 p = 0.031
No fear	59.4	20	t = 3.157 p = 0.0024

Table 4: Chi squared analysis of training methods and the number of behavioural attributes showed in 65 puppies as recorded by owners

Training technique	Number of behavioural attributes classed as mostly successful by owner N (%)		Results Chi Test
	1 - 2	3	
Positive reinforcement	9 (13.84)	29 (44.62)	X ² = 5.48 p = <0.02
Positive and Negative reinforcement	14 (21.53)	13 (20)	

Owner satisfaction

Fisher's exact test was used to test the relationship between puppies, owners and other family members, shown in Table 5. The relationship of puppies and owners did not appear to be influenced by the living conditions of puppies prior to rehoming ($P > 0.05$). The results suggest that owners of puppies reared in homes perceive their puppy to have a greater bond with other family members than the owners of puppies reared in outbuildings ($P < 0.05$). However, this may not be particularly reliable as the owners of puppies, rather than the other family members completed the questionnaires.

Table 5: Relationship between the living conditions (homes or outbuildings) from which 65 puppies were rehomed and the bond of owners and other family members tested using Fishers exact test

Bond	Owner (outbuilding) N (%)	Owner (home) N (%)	Other family members (outbuilding) N (%)	Other family members (home) N (%)
Strong	16 (24.62)	34 (52.31)	7 (10.77)	29 (44.62)
Well	4 (6.15)	11 (16.92)	13 (20)	16 (24.62)
Fishers Exact test result	P=0.7615		P=0.039	

* In the 'other family member (outbuilding)' bonded 'well' section, the data of one owner that reported 'other family members' to have bonded 'slightly' was added to the 'well' section for this class. This was because there was insufficient data for separate analysis and also because the bond statements are similar.

Other variables

The presence of one or more dogs in the household did not affect the amount of fear behaviours shown by puppies ($P > 0.05$). There was no significant difference in the number of fear behaviours shown by dogs and bitches ($P > 0.05$). There was no significant difference between gender and the success of house training, obedience or bite inhibition ($P > 0.05$).

Discussion

There are several limitations of this study. The sample size is fairly small and may therefore, not be representative of the whole dog population. Also, questionnaires were distributed in limited geographical area due to financial restraints and the requirement of the authors presence at each site to confirm that all participants were fully briefed, debriefed and gave informed consent. The findings of this study rely on the perceptions of puppy owners, and may not give a completely accurate data on the behaviour of puppies involved in the study. However, the perception of owners is very important as it is often this which leads to the abandonment, rehoming or euthanasia of dogs (Arkow and Dow, 1984). Another limitation of this study is that all participating puppy owners attended puppy classes. It is possible that the owners of such puppies may make more effort than owners that do not attend puppy classes. However, it is also possible that owners experiencing problems with their puppy may be more likely to attend puppy classes than owners that do not. Nevertheless, the findings from this study suggest that there are a number of factors which seem to affect the behaviour of puppies.

Puppies trained using positive reinforcement techniques exclusively were significantly more likely be reported as mostly successful for the three attributes listed (house training, bite inhibition and obedience). It is likely that puppies exhibiting a greater number of behavioural attributes will have a better bond with their owners than puppies showing fewer behavioural attributes. This may reduce the risk of euthanasia or rehoming of the dog (Arkow and Dow, 1984) and thus has substantial potential benefits for canine welfare. Similarly, Dreschel (2010) found that how "well-behaved" an owner perceived their dog to be significantly correlated with the dog's life-span. It was suggested that well-behaved

dogs are likely to be under less stress due to having a good bond with their owner. The results of this study suggest that owners of puppies reared in homes perceive their puppy to have a greater bond with other family members than the owners of puppies reared in outbuildings. However, this may not be particularly reliable as the owners of puppies, rather than the other family members completed the questionnaires. Despite this, owners of puppies from different living conditions prior to rehoming reported a significant difference in the bond of other family members with the puppy. This is an area requiring further research.

The behavioural attribute success of puppies trained solely using positive reinforcement supports the findings of Hiby et al. (2004) who found that dogs trained exclusively using reward-based methods were reported to be significantly more obedient than those trained using either punishment or a combination of reward and punishment. Blackwell et al. (2008) also found that dogs that were trained using only positive reinforcement were less likely to develop future behavior problems, while others that had been trained using punishment were more likely to develop fear-related responses. However, it could be suggested that puppies that were mostly successful at the given behavioural attributes were more likely to receive positive reinforcement only, as the owners may feel they do not have to use negative reinforcement. Nevertheless, This finding suggests that there is a link between positive reinforcement training methods and desirable behaviour and improved welfare in dogs.

The type of training method which owners claimed to use did not appear to affect the amount of fear behaviours shown by puppies ($p > 0.05$). This is contrary to the findings of some studies which found that dogs that had been trained using punishment were more likely to develop fear-related responses (Blackwell et al., 2008; Herron et al., 2010). However, no owners reported using negative reinforcement alone. It may be that owners claiming to use a combination of positive and negative reinforcement did not actively punish their dogs. Negative reinforcement can include ignoring the puppy and withdrawing food rewards, which would not be expected to increase fear, however, it also includes physical restraint and correction which may increase fear behaviours (Blackwell et al, 2008). It is possible that if a further category of 'positive punishment' had been added to the questionnaire, the results may have been more conclusive. However, it is also possible that fear behaviour related to training methods may develop at a later stage. It is likely that as the dogs enter adolescence the behaviour of the puppies will become more challenging (Fogle, 2006), thus the extent of negative reinforcement may increase. Despite the fact that negative reinforcement did not correlate with fear behaviours in this study, there is a great deal of current scientific literature emphasizing the detrimental effects negative reinforcement can have on the welfare of dogs (Hiby et al, 2004; Herron et al, 2010; Blackwell et al, 2008). Positive reinforcement was associated with desirable behavioural traits in puppies, and no advantageous results were observed as a result of including the use of negative reinforcement in the training method of puppy owners. Thus the findings of this study suggest that positive reinforcement alone correlates with desirable behaviours, supporting the findings of other researchers (Hiby et al, 2004; Herron et al, 2010; Blackwell et al, 2008).

Puppies reared in outbuildings were significantly more likely to show fear on more occasions than puppies reared in homes. Similarly, Appleby et al (2002) found that non-domestic maternal environments experienced during the first eight weeks of life or longer was associated with avoidance behaviour. Bennett and Rohlf (2007) found that dogs

purchased from pet shops or shelters were considered by their owners to be more 'unfriendly/aggressive' than dogs purchased from breeders. Puppies rehomed from outbuildings were significantly more likely to show fear of strangers than puppies reared in homes. This may be because puppies reared in homes were more frequently exposed to visitors of the household. This finding is alarming, as Dreschel (2010) found that stranger directed fear in dogs significantly predicts decreased lifespan compared to dogs which did not show stranger directed fear. In addition, Appleby et al. (2002) found that dogs from non-domestic maternal environments were significantly more likely to show aggression to unfamiliar people than dogs reared in domestic maternal environments.

It has been suggested that puppies which do not experience certain stimuli during their socialisation period are more likely to develop a fear-response, which can manifest as either avoidance or defensive aggression (Serpell and Jagoe, 1995). It is possible that puppies in this study that were reared in homes experienced the presence of strangers more often than puppies reared in outbuildings. Therefore, it could be suggested that puppies from this study that were reared in outbuildings are more likely to show avoidance or defensive aggression as adults, based on previous findings. This may prove a very important factor for consideration for potential puppy owners, and it is likely that if they were made aware of these findings, they would be more likely to choose a puppy reared in a domestic maternal environment.

There was no significant difference in the fear behaviours shown by dogs and bitches. Similarly Seksel et al (1999) found no gender difference in the responses of puppies subjected to novel stimuli, and Gazzano et al (2008) found that the gender of puppies appeared not to be a factor in the display of undesirable behaviours. It therefore appears that gender has no effect on fear shown by puppies. The success of house-training, bite inhibition and obedience similarly showed no difference between male and female puppies. Hart and Hart (1985) suggested that females are easier to train than males. However, Bennett and Rohlf (2007) found no difference between the amount of undesirable behaviours between male and female adult dogs. Thus recent literature supports the results of this study and suggests that it is unlikely that the gender of puppies significantly affects the fear response or the ease of training of dogs and puppies.

The age at rehoming did not have a significant effect on the number of fear behaviours shown by puppies in the study. This could account for the variation of suggestions (six weeks- Appleby, 2004, six-eight weeks -Scott and Marston, 1950; eight weeks- Dunbar, 2004; after nine weeks- Slabbert and Rasa, 1993). It is possible that some breeders may invest a great deal of time and effort in the socialisation of puppies they have bred, whilst others may make no effort. Therefore, the quality of time spent with the breeder may influence the behaviour of puppies to a greater extent than the age at rehoming. This is an area for further research. Another possible reason could be that the dogs in this study were aged six months or under, and that differences of the age at rehoming do not show until after this age.

The breed group findings of this study are unlikely to be representative of the whole population as some of the sample sizes were very small (toy, hound). However, some of the samples were reasonable, and support other research. For example, dogs from the working group showed the lowest frequency of fear behaviours ($M=0.33$, $SD= 0.52$). This may be due to the breed's origin. Working dogs were bred to be better at guarding and attacking (Bradshaw et al., 1996). It is possible that this breed group has been selectively bred for its confidence, and thus may show less fear than other breed groups. However,

the low frequency of fear behaviours of the working group in this study may have been influenced by the condition from which puppies of this group were rehomed, as all the working dogs were reared in homes. Similarly, all puppies from the toy group were reared in homes, and the group showed the second lowest mean of fear behaviours. All the other groups showed variation in conditions prior to rehoming. Dogs from the pastoral group showed the highest average number of fear behaviours ($M=2.1$, $SD=2.28$), however, the group also had the greatest confidence interval suggesting that there was a wide range of results from dogs within the group. However, the Border Collie represented 70% of the pastoral group and has been recorded as showing more fearful behaviour than other breeds by other authors (Fogle, 2006; Bailey, 2004). Breed group variations in fear shown were apparent, although due to the small sample size of this study, no conclusions can be drawn.

Conclusion

Despite the limitations of this study, some important conclusions can be made. There appears to be some management factors which can reduce the amount of fear behaviours and increase the success of basic behavioural attributes. This study has found that puppies reared in outbuildings are much more likely to develop fear behaviours on more occasions, than puppies reared in homes. It appears likely that puppies reared in homes are exposed to a wider range of stimuli from a younger age, and thus become better adjusted. Fearful behaviour in dogs has been shown to have many negative effects on the welfare of pet and owner. Therefore it is vital that the development of fear in dogs is minimised. This study also supports other research which has found that positive reinforcement has more beneficial effects than a combination of both positive and negative reinforcement. It appears that pets are likely to exhibit more desirable behaviours when trained using positive reinforcement exclusively. The age at rehoming did not appear to significantly affect the behaviour of puppies. It is likely that a study with a greater sample is needed for any definitive conclusions to be drawn.

The findings of this study are of importance to both breeders of dogs and potential puppy buyers. The perception of the owner on how well-behaved their dog is appears to be a fundamental aspect of canine welfare. The reduction in the frequency of fear behaviours is likely to reduce the incidence of some behavioural problems such as defensive aggression and separation anxiety. This is likely to improve the pet-owner bond, which may help to reduce the number of dogs which are abandoned, rehomed and euthanised. Further research into the development of undesirable behaviours may help to improve the welfare of canines, other companion animals and their owners.

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